WHAT IS CLAIMED IS:

1. A gap measuring method comprising the steps of:

shifting a wavelength of light stepwise within a predetermined wavelength range to use the light for measuring a gap;

taking an image of an interference fringe, which is generated owing to a gap provided in a measured object and the used light with the shifted wavelength, by a camera correspondingly to each step of the shifted wavelength;

obtaining a change in the intensity of the images of the interference fringes taken by said camera at each of predetermined positions of each image, over said predetermined wavelength range; and

determining gap values of a plurality of points of the gap based on the obtained changes in the density.

2. A gap measuring method according to claim 1, wherein said step of determining a gap value includes the steps of:

obtaining a theoretical change in the intensity of the images, over said predetermined wavelength range, correspondingly to each of preliminarily set gap values; and

determining the gap value of said measured object based on the change in the intensity of the fixed position of each image taken by the camera and the obtained theoretical

changes in the intensity.

3. A gap measuring method according to claim 1, wherein said step of determining a gap value includes the steps of:

obtaining a plurality of peaks in said change in the intensity of the images, over the predetermined wavelength range; and calculating gap values of a plurality of points of the measured object based on a plurality of wavelengths respectively corresponding to the peaks.

4. A gap measuring method according to claim 1, wherein said interference fringe is obtained by utilizing light transmitted by said measured object.

5. A gap measuring method according to claim 1, wherein said interference fringe is obtained by utilizing light reflected from said measured object.

6. A gap measuring method according to claim 1, wherein said shifted wavelength of the used light is obtained by shifting a wavelength of light emitted from a light source to said measured object.

7. A gap measuring method according to claim 1, wherein said shifted wavelength of the used light is obtained by

providing a filter, which is adapted to selectively transmit a certain wavelength of light to the side of said camera.

8. A gap measuring method according to claim 1, wherein said change in the density of images taken by the camera, is corrected in consideration of variable factors.

9. A gap measuring method according to claim 1, wherein the said image consists of a plurality of pixels, to measure the gap value for each of the pixels.

10. A shape measuring method comprising the steps of:

measuring gap values of a gap between a pair of members, one of which has a flat surface, by the gap measuring method according to claim 1; and

determining a shape of the other member constituting said gap, based on the measured gap values.

11. A gap measuring apparatus comprising:

a wavelength variable light source for shifting a wavelength of light stepwise within a predetermined range and applying the light with the shifted wavelength onto a light transmissible object that is to be measured and is provided with a gap;

a camera for taking an image of an interference fringe formed by the light transmitted by said object, correspondingly to each step of the shifted wavelength;

an image memory for storing images taken by said camera; and

means for obtaining a change in the intensity of the images taken by said camera, at each of predetermined positions of each image over said predetermined wavelength range; and means for determining gap values of a plurality of points of the gap based on the obtained changes in the intensity.

12. A gap measuring apparatus comprising:

a white light source for applying white light onto a light transmissible object that is to be measured and is provided with a gap;

a filter for shifting, stepwise, a wavelength of the light transmitted by said measured object within a predetermined wavelength range to send the light with the shifted wavelength to said camera;

a camera for taking an image of an interference fringe formed by said light transmitted by the filter, correspondingly to each step of the shifted wavelength;

an image memory for storing images taken by said camera;

means for obtaining a change in the intensity of the images taken by said camera, at each of predetermined positions of each image over said predetermined wavelength range; and means for determining gap values of a plurality of points of the gap based on the obtained changes in the intensity.

13. A gap measuring apparatus comprising:

a wavelength variable light source for shifting a wavelength of light stepwise within a predetermined range and emitting the light with the shifted wavelength;

a camera for taking an image of an interference fringe of light;

optical means for directing the light emitted from said light source to a measured object provided with a gap and directing the light reflected by said measured object to said camera;

an image memory for storing images of interference fringes formed by the light from said optical means and taken by said camera; and

means for obtaining a change in the intensity of the images taken by said camera, at each of predetermined positions of each image over said predetermined range; and means for determining gap values of a plurality of points of the gap based on the obtained changes in the intensity.

14. A gap measuring apparatus comprising:

a white light source for emitting white light;

a camera for taking an image of an interference fringe of light;

optical means for directing the light emitted from said light source to a measured object provided with a gap and directing the light reflected by said measured object to said camera;

a filter for shifting, stepwise, a wavelength of the light from said optical means within a predetermined range to send the light with the shifted wavelength to said camera;

an image memory for storing images of interference fringes formed by the light from said optical means and taken by said camera; and

means for obtaining a change in the intensity of the images taken by said camera, at each of predetermined positions of each image over said predetermined wavelength range; and means for determining gap values of a plurality of points of the gap based on the obtained changes in the intensity.

15. A gap measuring apparatus according to claim 11, wherein said means for determining a gap value includes:

a reference data memory for storing data representing a theoretical change in the intensity of the images, over said predetermined range, correspondingly to each of preliminarily set gap values; and

gap value comparison and determination means for determining gap values of a plurality of points of gap based on the changes in the intensity of the images and the theoretical changes in the intensity.

16. A gap measuring apparatus according to claim 11, wherein said means for determining the gap values includes:

means for obtaining a plurality of peaks in said change in the intensity of the images, over the predetermined wavelength range; and means for calculating gap values of a plurality of points of the gap based on a plurality of wavelengths respectively corresponding to the peaks.

17. A gap measuring apparatus according to claim 11, which further comprises correction means for correcting the change in the intensity of the images taken by the camera, in consideration of variable factors.

18. A shape measuring apparatus comprising:

a wavelength variable light source for shifting a wavelength of light stepwise within a predetermined range

and irradiating the light with the shifted wavelength onto a light transmissible object that is to be measured;

a light transmissible plate-like element which has a flat surface and is oppositely placed to said object with intervention of a gap;

a camera for taking an image of an interference fringe formed by the light with the shifted wavelength transmitted by said object and said plate-like element, correspondingly to each step of the shifted wavelength;

an image memory for storing images taken by said camera;

means for obtaining a change in the intensity of the images taken by said camera, at each of predetermined positions of each image over said predetermined range; means for determining gap values of a plurality of points of the gap based on the obtained changes in the intensity; and

gap-value-to-shape conversion means for determining a shape of said object based on the determined gap values.

19. A shape measuring apparatus comprising:

a white light source for emitting white light onto a light transmissible object that is to be measured;

a light transmissible plate-like element which has a flat surface and is oppositely placed to said object with intervention of a gap;

a filter for shifting, stepwise, wavelength of the light transmitted by the object and the plate-like element within a predetermined range to send the light with the shifted wavelength to said camera;

a camera for taking an image of an interference fringe formed by said light transmitted by said filter, correspondingly to each step of the shifted wavelength;

an image memory for storing images taken by said camera;

means for obtaining a change in the intensity of the images taken by said camera, at each of predetermined positions of each image over said predetermined wavelength range; means for determining gap values of a plurality of points of the gap based on the obtained changes in the intensity; and

gap-value-to-shape conversion means for determining a shape of said object based on the determined gap values.

20. A shape measuring apparatus comprising:

a wavelength variable light source for shifting a wavelength of light stepwise within a predetermined range and emitting the light with the shifted wavelength onto an object to be measured;

a light transmissible plate-like element which has a flat surface and is oppositely placed to said object with

intervention of a gap;

a camera for taking an image of an interference fringe of light;

optical means for directing the light emitted from said light source to an object to be measured and directing the light reflected by said object and said plate-like element to said camera;

an image memory for storing images of interference fringes formed by the light from said optical means and taken by said camera;

means for obtaining a change in the intensity of the images taken by said camera, at each of predetermined positions of each image over said predetermined wavelength range; means for determining gap values of a plurality of points of the gap based on the obtained changes in the intensity; and

gap-value-to-shape conversion means for determining a shape of said object based on the determined gap values.

21. A shape measuring apparatus comprising:

a white light source for emitting white light onto an object that is to be measured;

a light transmissible plate-like element which has a flat surface and is oppositely placed to said object with intervention of a gap;

a camera for taking an image of an interference fringe of light;

optical means for directing the light emitted from said light source to the object and directing the light reflected by said object and said plate-like element to said camera;

a filter for shifting, stepwise, wavelength of light transmitted from said optical means within a predetermined range to send the light with the shifted wavelength to said camera;

an image memory for storing images of interference fringes formed by the light from said filter and taken by said camera;

means for obtaining a change in the intensity of the images taken by said camera, at each of predetermined positions of each image over said predetermined wavelength range; means for determining gap values of a plurality of points of the gap based on the obtained changes in the intensity; and

gap-value-to-shape conversion means for determining a shape of said object based on the determined gap values.

22. A shape measuring apparatus according to claim 18, wherein said means for determining a gap value includes:

a reference data memory for storing data representing a theoretical change in the intensity of the images, over said

predetermined range, correspondingly to each of preliminarily set gap values; and

gap value comparison and determination means for determining gap values of a plurality of points of the gap based on the changes in intensity of the images and the theoretical changes in the intensity.

23. A shape measuring apparatus according to claim 18, wherein said means for determining the gap values includes:

means for obtaining a plurality of peaks in said change in the intensity of the images, over the predetermined wavelength range; and means for calculating gap values of a plurality of the gap based on a plurality of wavelengths respectively corresponding to the peaks.

24. A shape measuring apparatus according to claim 18, which further comprises correction means for correcting the change in the intensity of the images taken by the camera, in consideration of variable factors.

25. A manufacturing method for a liquid crystal device, in which a gap between two substrates is filled with liquid crystal and sealed, wherein gap values of a plurality of points of the gap is measured by utilizing said gap measuring apparatus according to claim 11, and wherein

liquid crystal is injected into said gap when the gap values are within a prescribed range.

26. A gap measuring apparatus according to claim 12, wherein said means for determining a gap value includes:

a reference data memory for storing data representing a theoretical change in the intensity of the images, over said predetermined range, correspondingly to each of preliminarily set gap values; and

gap value comparison and determination means for determining gap values of a plurality of points of gap based on the changes in the intensity the images and the theoretical changes in the intensity.

27. A gap measuring apparatus according to claim 13, wherein said means for determining a gap value includes:

a reference data memory for storing data representing a theoretical change in the intensity of the images, over said predetermined range, correspondingly to each of preliminarily set gap values; and

gap value comparison and determination means for determining gap values of a plurality of points of gap based on the changes in the intensity the images and the theoretical changes in the intensity.

28. A gap measuring apparatus according to claim 14, wherein said means for determining a gap value includes:

a reference data memory for storing data representing a theoretical change in the intensity of the images, over said predetermined range, correspondingly to each of preliminarily set gap values; and

gap value comparison and determination means for determining gap values of a plurality of points of gap based on the changes in the intensity the images and the theoretical changes in the intensity.

29. A gap measuring apparatus according to claim 12, wherein said means for determining the gap values includes:

means for obtaining a plurality of peaks in said change in the intensity of the images, over the predetermined wavelength range; and means for calculating gap values of a plurality of points of the gap based on a plurality of wavelengths respectively corresponding to the peaks.

30. A gap measuring apparatus according to claim 13, wherein said means for determining the gap values includes:

means for obtaining a plurality of peaks in said change in the intensity of the images, over the predetermined wavelength range; and means for calculating gap values of a plurality of points of the gap based on a plurality of

wavelengths respectively corresponding to the peaks.

31. A gap measuring apparatus according to claim 14, wherein said means for determining the gap values includes:

means for obtaining a plurality of peaks in said change in the intensity of the images, over the predetermined wavelength range; and means for calculating gap values of a plurality of points of the gap based on a plurality of wavelengths respectively corresponding to the peaks.

32. A gap measuring apparatus according to claim 12, which further comprises correction means for correcting the change in the intensity of the images taken by the camera, in consideration of variable factors.

33. A gap measuring apparatus according to claim 13, which further comprises correction means for correcting the change in the intensity of the images taken by the camera, in consideration of variable factors.

34. A gap measuring apparatus according to claim 14, which further comprises correction means for correcting the change in the intensity of the images taken by the camera, in consideration of variable factors.

35. A shape measuring apparatus according to claim 19, wherein said means for determining a gap value includes:

a reference data memory for storing data representing a theoretical change in the intensity of the images, over said predetermined range, correspondingly to each of preliminarily set gap values; and

gap value comparison and determination means for determining gap values of a plurality of points of the gap based on the changes in intensity of the images and the theoretical changes in the intensity.

36. A shape measuring apparatus according to claim 20, wherein said means for determining a gap value includes:

a reference data memory for storing data representing a theoretical change in the intensity of the images, over said predetermined range, correspondingly to each of preliminarily set gap values; and

gap value comparison and determination means for determining gap values of a plurality of points of the gap based on the changes in intensity of the images and the theoretical changes in the intensity.

37. A shape measuring apparatus according to claim 21, wherein said means for determining a gap value includes:

a reference data memory for storing data representing a

theoretical change in the intensity of the images, over said predetermined range, correspondingly to each of preliminarily set gap values; and

gap value comparison and determination means for determining gap values of a plurality of points of the gap based on the changes in intensity of the images and the theoretical changes in the intensity.

38. A shape measuring apparatus according to claim 19, wherein said means for determining the gap values includes:

means for obtaining a plurality of peaks in said change in the intensity of the images, over the predetermined wavelength range; and means for calculating gap values of a plurality of the gap based on a plurality of wavelengths respectively corresponding to the peaks.

39. A shape measuring apparatus according to claim 20, wherein said means for determining the gap values includes:

means for obtaining a plurality of peaks in said change in the intensity of the images, over the predetermined wavelength range; and means for calculating gap values of a plurality of the gap based on a plurality of wavelengths respectively corresponding to the peaks.

40. A shape measuring apparatus according to claim 21,

wherein said means for determining the gap values includes:

means for obtaining a plurality of peaks in said change in the intensity of the images, over the predetermined wavelength range; and means for calculating gap values of a plurality of the gap based on a plurality of wavelengths respectively corresponding to the peaks.

41. A shape measuring apparatus according to claim 19, which further comprises correction means for correcting the change in the intensity of the images taken by the camera, in consideration of variable factors.

42. A shape measuring apparatus according to claim 20, which further comprises correction means for correcting the change in the intensity of the images taken by the camera, in consideration of variable factors.

43. A shape measuring apparatus according to claim 21, which further comprises correction means for correcting the change in the intensity of the images taken by the camera, in consideration of variable factors.

44. A manufacturing method for a liquid crystal device, in which a gap between two substrates is filled with liquid crystal and sealed, wherein gap values of a plurality of

points of the gap is measured by utilizing said gap measuring apparatus according to claim 12, and wherein liquid crystal is injected into said gap when the gap values are within a prescribed range.

45. A manufacturing method for a liquid crystal device, in which a gap between two substrates is filled with liquid crystal and sealed, wherein gap values of a plurality of points of the gap is measured by utilizing said gap measuring apparatus according to claim 13, and wherein liquid crystal is injected into said gap when the gap values are within a prescribed range.

46. A manufacturing method for a liquid crystal device, in which a gap between two substrates is filled with liquid crystal and sealed, wherein gap values of a plurality of points of the gap is measured by utilizing said gap measuring apparatus according to claim 14, and wherein liquid crystal is injected into said gap when the gap values are within a prescribed range.